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ESTCube-2 mission analysis: Earth observation imager system

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1. Extended Abstract

In this paper, the preliminary results of development of small, lightweight, two-spectral Earth observation imaging (EOI) system for nanosatellites will be presented. The ESTCube-2 satellite [1] will house EOI system as a payload system. In addition, ESTCube-2 mission will evaluate satellite deorbiting system which uses a Coulomb drag effect [2], C-band spectrally efficient communications payload [3], thin protective coating experiment [4]. The satellite will commit actual deorbiting at the end of mission.

The EOI structural design and optics assembly are based on the European student Earth orbiter (ESEO) secondary camera [5]. The EOI will comply with the CubeSat standard. Moreover, while capable of taking scientific grade images, the instrument will fit into single unit of CubeSat. This system will use a dual optics assembly each with frame-type sensor and bandpass filter. Scientific grade performance will be accomplished by elaborate design and solid characterization of the EOI hardware and on-board calibration unit. The biggest advantage of this system is that it has been designed as a mission-independent unit, meaning it provides its own image processing and storage. Most nanosatellites' optical payloads require dedicated software and interface using the spacecraft's on-board computer.

Two narrow (25nm) spectral bands have been chosen for the EOI system: red and NIR. Red (650-680 nm) and NIR (855-875 nm) bands match the Sentinel-2 bands 4 (red) and 8a (NIR). The two mentioned bands are useful for vegetation monitoring. By comparing results from both spacecrafts, validation of optical payload performance could be accomplished. The normalized difference vegetation index (NDVI) can be calculated from measurements. NDVI determination by Sentinel-2 measurements involves spectral bands 4 and 8. However, band 8a has been chosen due to a decreased effect of atmospheric absorption.

2. References

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